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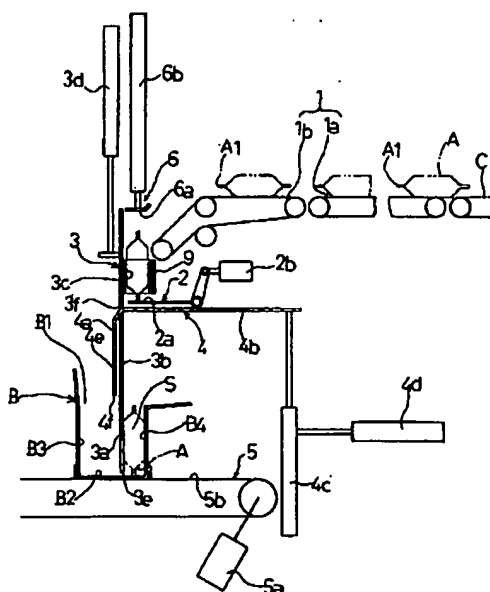
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(54) 【発明の名称】 箱詰め装置

(57) 【要約】

【目的】 外形が不定形状の物品を箱内へ確実に詰め込む。

【構成】鉛直ガイド3及びL形ガイド4の下動により箱B内に挿入された鉛直ガイド3の下部3aとL形ガイド4の先端鉛直部4aとで、シャッター2の下方に物品A横列分の挿入スペースSが開けられる。その後シャッター2を下方へ開動させて該シャッター2上の横一列の物品A…が下降し箱B内に詰め込まれる。その後シャッター2を開動させて整理機構1によりシャッター2上に次の物品A…が横一列に整列され、これと同時にL形ガイド4を上動させて先端鉛直部4aを箱B内から抜く。その後、間欠移送機構5により箱Bを物品A横一列分だけ前後縦方向へ移動してからL形ガイド4を下動させて、シャッター2の下方に物品A横一列分の挿入スペースSが既に詰め込まれた横一列物品A…の隣りに開けられ、シャッター2の開動により上述の如く横一列の物品A…の詰め込みが順次繰り返される。



【特許請求の範囲】

【請求項1】 物品を左右横方向へ一列に整列する整列機構の下流側に、これら横一列に整列された物品の底面と当接して載置するシャッターを上下方向へ開閉自在に設け、このシャッター上の物品の側面と当接する鉛直ガイドを上下方向へ往復動自在に設けて、その下動時に該鉛直ガイドの下部を箱の上面開口内に挿入させ、上記シャッターの下方にL形ガイドを上下方向へ往復動自在に設けて、その下動時に先端鉛直部を箱の上面開口内に挿入させると共に、箱と係合して物品の横整列方向と直交する前後縦方向へ物品横一列分ずつ間欠的に移動する間欠移送機構を設けたことを特徴とする箱詰め装置。

【請求項2】 L形ガイドを前後縦方向へ往復動自在にし、鉛直ガイドの下部及び中間部とL形ガイドの先端鉛直部を夫々櫛歯状に形成して、これら両者を上下方向及び前後縦方向へ移動自在に嵌合させた請求項1記載の箱詰め装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、例えばダンボールケース等の箱内に所定数の物品を整列させて詰め込む箱詰め装置に関する。

【0002】

【従来の技術】 従来、この種の箱詰め装置として例えば産業用ロボット等により物品を吸着するか、又は機械的にチャッキングして持ち上げ、これを上面が開いた箱内に上方から入れ込むものや、所定数の物品を整列し積み重ねて集積させた後に、これを水平移送して側面が開いた箱内に横方向から詰め込むものがある。

【0003】

【発明が解決しようとする課題】 しかし乍ら、このような従来の箱詰め装置では、前者の場合、物品を1個ずつ持ち上げて箱内に移送すれば、時間がかかって作業能率が悪く、作業能率を向上させるため、ロボット等の持ち上げ装置を複数セット連動させると、コストが高くなるばかりでなく広いスペースが必要になるという問題がある。

【0004】 更に前者の場合には、物品が例えば粉状、粒状、チップ状等の流動性があるピロー包装機等により袋詰めされるものや、袋内にガス、空気等が充填されるもののように、その外形が安定しない不定形状であると、吸着やチャッキングが確実に行えず、持ち上げ移送中に物品を落下する恐れがあるという問題もある。また後者の場合には、物品を予め集積する必要があるため、物品の外形が一定形状のものが適しており、物品の外形が上述した不定形状であると集積した際に崩れ易く、集積した物品全体をスムーズに箱内へ入れ込めず適さないという問題がある。

【0005】 本発明は斯る従来事情に鑑み、外形が不定形状の物品を箱内へ確実に詰め込むことを目的とし、箱

詰め作業中に箱内の物品を一定形状に保つことを他の目的とする。

【0006】

【課題を解決するための手段】 上記課題を解決するために本発明が講ずる技術的手段は、物品を左右横方向へ一列に整列する整列機構の下流側に、これら横一列に整列された物品の底面と当接して載置するシャッターを上下方向へ開閉自在に設け、このシャッター上の物品の側面と当接する鉛直ガイドを上下方向へ往復動自在に設けて、その下動時に該鉛直ガイドの下部を箱の上面開口内に挿入させ、上記シャッターの下方にL形ガイドを上下方向へ往復動自在に設けて、その下動時に先端鉛直部を箱の上面開口内に挿入させると共に、箱と係合して物品の横整列方向と直交する前後縦方向へ物品横一列分ずつ間欠的に移動する間欠移送機構を設けたことを特徴とするものである。

【0007】 そして、L形ガイドを前後縦方向へ往復動自在にし、鉛直ガイドの下部及び中間部とL形ガイドの先端鉛直部を夫々櫛歯状に形成して、これら両者を上下方向及び前後縦方向へ移動自在に嵌合させることが好ましい。

【0008】

【作用】 本発明は上記技術的手段によれば、鉛直ガイド及びL形ガイドの下動により箱内に挿入された鉛直ガイドの下部とL形ガイドの先端鉛直部とで、シャッターの下方に物品横一列分の挿入スペースが開けられ、その後シャッターを下方へ開動させて該シャッター上の横一列の物品が下降し箱内に詰め込まれ、その後シャッターを開動させて整列機構によりシャッター上に次の物品が横一列に整列され、これと同時にL形ガイドを上動させて先端鉛直部を箱内から抜き、その後、間欠移送機構により箱を物品横一列分だけ前後縦方向へ移動してからL形ガイドを下動させて、シャッターの下方に物品横一列分の挿入スペースが既に詰め込まれた横一列物品の隣りに開けられ、シャッターの開動により上述の如く横一列の物品の詰め込みが順次繰り返されるものである。

【0009】 そして、箱内に横一列の物品が詰め込まれてL形ガイドを上動した後に、L形ガイドを前後縦方向へ移動させて先端鉛直部と鉛直ガイドの中間部を嵌合し、その後にL形ガイドを下動し、箱とL形ガイドを共に上記縦移動と逆方向へ縦移動させて、シャッターの下方に挿入スペースを開けることにより、既に箱詰めされた横一列の物品が常時前後縦方向へ挟み込まれて圧縮保持されるものである。

【0010】

【実施例】 以下、本発明の一実施例を図面に基づいて説明する。この実施例は図1及び図2に示す如く、袋詰めされた自立不能な物品Aを物品供給源から搬送コンベアCにより倒れた状態で一定間隔毎に移送し、その下流側に配設される整列機構1で各物品Aを左右横方向へ複

数、例えば4個ずつ1列に整列しながら起立させてシャッター2上に供給すると共に、これら左右横方向へ一列に整列された物品A…を上面が開口した箱B内に前後縦方向へ複数列、例えば3列入れ込むものである。

【0011】整列機構1は、上記搬送コンベアCから前後縦方向へ移送搬出された各物品Aを左右横方向へ4つに振り分ける振り分け部1aと、これら振り分けられた各物品Aを90度反転して起立させる起立部1bとからなる。振り分け部1aは、例えば図2に示すような従来周知構造の振り分け装置等で構成され、搬送コンベアCから順次搬出される各物品Aを、前後縦方向へ移送しながら左右横方向へ各物品A毎に順次物品Aの左右幅寸法分ずつ移動させて起立部1bへ供給する。起立部1bは、例えば図1に示すような傾斜コンベアや傾斜板等で構成され、振り分け部1aから搬出される倒れた各物品Aを、前後縦方向の移動に伴い徐々に反転してシャッター2上に起立させる。

【0012】シャッター2は、上記起立部1b下流端の下方に開閉板2aを配置し、その上面を起立された各物品Aの底面A1に当接して載置させると共に、この開閉板2aの基端に例えばエアシリンダ等の開閉用駆動部2bを連設して、該開閉板2aを上下方向へ回動自在に支持する。この開閉用駆動部2bは、制御部により作動制御され、初期状態で開閉板2aを水平状に閉鎖して待機させ、この開閉板2a上に整列機構1から物品Aが横方向一列に整列載置されて、しかも開閉板2aの直下に後述する鉛直ガイド3の下部3aとL形ガイド4の先端鉛直部4aとにより物品A横一列分の挿入スペースSが開けられた時に、開閉板2aを下方へ開動させ、その後、該開閉板2a上の物品A…が下降してから開閉板2aを開動させて初期状態に戻す。

【0013】鉛直ガイド3は、上記シャッター2の下方に配置される箱Bの内底面B2から整列機構1の起立部1bまでの上下寸法を有する薄板で、その少なくとも下部3aの左右幅寸法を箱Bの左右内のり寸法より若干短く形成すると共に、中間部3b又は上部3cの後面をシャッター2上に載置された横一列の物品A…の前側面に当接させ、上部3cの前面に例えばエアシリンダ等の上下用駆動部3dを連設して上下方向へ往復動自在に支持する。この上下用駆動部3dは、制御部により作動制御され、初期状態で鉛直ガイド3を上動しその下端3eを箱Bの上面開口B1から上方へ離すと共に、中間部3bをシャッター2上の物品A…に当接して待機させ、後述する間欠移送機構5よりシャッター2の直下へ箱Bが移送されて停止した時に、鉛直ガイド3を下動させてその下部3aを箱B内に挿入するが、下端3eを箱Bの内底面B2に当接させず、更に上部3cをシャッター2上の物品A…に当接させその後、下部3aの前面が箱Bの前側内面B3と当接して最後の横一列の物品A…が箱詰めされてから、鉛直ガイド3を上動させて初期状態に戻す。更に、鉛直ガイド3の下部3a及び中間部3bには物品の左右幅寸法より短い左右幅寸法の

帯状空間3fを、シャッター2上に載置された横一列の各物品A…の左右中央位置と夫々対向して複数本下端3eまで横設することにより櫛歯状に形成する。

【0014】L形ガイド4は、水平基板4bの先端を下方へ屈曲するか、又は固着して薄板状の先端鉛直部4aを設け、この先端鉛直部4aの左右幅寸法を箱Bの左右内のり寸法より短く形成すると共に、上下寸法を箱Bの内底面B2から上面開口B1までの高さ寸法より長く形成し、水平基板4bの基端には例えばエアシリンダ等の上下用駆動部4cと前後用駆動部4dを連設して、先端鉛直部4aを上下方向及び前後縦方向へ往復動自在に支持する。更に、先端部4aは上記鉛直ガイド3下部3aの帯状空間3f…と対向して、上下方向及び前後縦方向へ移動自在に挿通する帯状片4e…を、下端4fまで凸設することにより櫛歯状に形成する。

【0015】L形ガイド4の上下用駆動部4c及び前後用駆動部4dは、夫々制御部により作動制御され、初期状態で先端鉛直部4aを上動しその下端4fを箱Bの上面開口B1から上方へ離すと共に、帯状片4e…を鉛直ガイド3下部3a及び中間部3bの帯状空間3fに挿通しこれら両者を嵌合させて、帯状片4e…の後面を鉛直ガイド3下部3a又は中間部3bの後面より若干前方位置するか、或いは同一平面上に位置して待機させ、鉛直ガイド3の下動時と鉛直ガイド3の下動状態でのL形ガイド4前進後に夫々先端鉛直部4aを下動させて箱B内に挿入し、これに続き先端鉛直部4aを後退させて、その前面と鉛直ガイド3下部3aの後面との間に物品A横一列分、即ち物品Aの前後幅寸法の挿入スペースSを開け、その後、シャッター2の開動と同時に上動し前進させて初期状態に戻す。

【0016】間欠移送機構5は、例えば図1に示すような箱供給位置からシャッター2の下方に亘って前後縦方向へ横設した間欠送りコンベア等で構成され、その駆動部5aを制御部により作動制御し、箱供給位置で上面が開口した箱Bを搬送面5b上に移動不能に載置することにより、搬送面5bを後退させて箱Bの後側内面B4と上記鉛直ガイド3下部3aの後面の延長面とが平行で、しかもこれら両面の間隔が物品Aの前後幅寸法と一致した時に停止し、その後、L形ガイド4の先端鉛直部4aが後退する度に、これと略同時に物品A横一列分、即ち物品Aの前後幅寸法ずつ間欠的に移動させ、更にその後鉛直ガイド3が上動してから搬送面5bを前進させて箱Bを箱供給位置に戻す。

【0017】また、前記シャッター2の上方には、図1に示す如く押し込みプッシャー6を上下方向へ往復動自在に設け、その駆動部6bを制御部により制御し、初期状態で押送面6aをシャッター2上に載置された横一列の物品A…から上方へ離して待機させ、シャッター2の開動と略同時に押送面6aを下動させて物品A…の下降をスムーズにし、その後、シャッター2の開動と同時に押送面6aを上動させて初期状態に戻す。

【0018】更に、シャッター2の左右側方には、図3に示す如くシャッター2上に載置された横一列の物品A…の左右端面と相接して上下方向へ案内しながら、これらを左右横方向へ位置決めするサイドガイド7、7を対向状に立設し、必要に応じてどちらか一方のサイドガイド7上端を低くして圧縮用プッシャー8を左右横方向へ往復動自在に設け、整列機構1の起立部1bからシャッター2上に各物品Aが横一列に供給された直後に、圧縮用プッシャー8を突出動させることにより、横一列の物品A…を左右横方向へ圧縮してサイドガイド7、7の間へス

【0019】次に、斯る箱詰め装置の作動について説明する。先ず、図4に示す如く整列機構1からシャッター2上へ各物品Aが横一列に整列されながら起立して供給されると同時に、間欠移送機構5により箱供給位置から箱Bがシャッター2の下方に供給される。この箱Bの供給が停止すると、図5に示す如く鉛直ガイド3及びL形ガイド4が共に下動してこれら鉛直ガイド3の下部3a及び先端鉛直部4aを箱B内に挿入し、これに続き図6に示す如くL形ガイド4が後退して、先端鉛直部4aの前面と鉛直ガイド3下部3aの後面との間に、物品A横一列分の挿入スペースSをシャッター2の直下に位置させて開ける。

【0020】その直後、図7に示す如くシャッター2が開動して、その上方に載置された横一列の物品A…が、その整列状態を崩すことなく下降して上記挿入スペースSに詰め込まれ、この詰め込みが終了すると、図8に示す如くL形ガイド4が上動して、その先端鉛直部4aを箱B内から引き抜く。

【0021】その後、図9に示す如くL形ガイド4が前進しその先端鉛直部4aを鉛直ガイド3の中間部3bに嵌合させて、先端鉛直部4aの後面が鉛直ガイド3中間部3bの後面より若干前方か又は同一平面上になってから、図10に示す如くL形ガイド4が下動して先端鉛直部4aを再び箱B内に挿入する。

【0022】これに続き、図11に示す如くL形ガイド4が後退して先端鉛直部4aの後面と箱Bの後側内面B4との間に、既に箱詰めされた横一列の物品A…を挟み込むと同時に、箱Bが間欠移送機構5により物品A横一列分だけ後退して、先端鉛直部4aの前面と鉛直ガイド3下部3aの後面との間に物品A横一列の挿入スペースSをシャッター2の直下に位置させて開ける。

【0023】それ以降は、図12～図16に示す如く上述した図7～図11と同様の動作が繰り返され、その後、図17～図18に示す如く最終列の物品A…が箱B内に詰め込まれてからL形ガイド4が上動すると、図19に示す如く鉛直ガイド3が上動し、箱詰めの完了した箱Bが間欠移送機構5により前進して箱供給位置に戻される。そして、

箱供給位置で箱詰めの完了した箱Bと新しい箱Bとを交換すれば、上述した動作が繰り返される。

【0024】一方、図20及び図21～図36に示すものは、本発明の他の実施例であり、このものは袋詰めされた自立可能な物品Aを物品供給源から搬送コンベアCにより倒れた状態で一定間隔毎に整列機構1へ移送する場合を示し、鉛直ガイド3の下部3a及び中間部3bとL形ガイド4の先端鉛直部4aを夫々櫛歯状にせず平板状に形成して、図21に示す初期状態と図26及び図31に示すL形ガイド4の上動前進時に、先端鉛直部4aの前面を鉛直ガイド3の後面に可能な限り接近させ、その後、図22、図27及び図32に示す如く先端鉛直部4aを鉛直ガイド3に接近させたままL形ガイド4を下動し、図23、図28及び図33に示す如くL形ガイド4を後退させて、シャッター2の下方に挿入スペースSを開けるものである。

【0025】また、この実施例の作動は図21～図36に示すものに限定されず、例えば図21に示す初期状態で鉛直ガイド3の後面と先端鉛直部4aの前面との間に物品横一列分の間隔を開けてL形ガイド4を下動すると共に、図25及び図26の状態からL形ガイド4を前進させず、間欠移送機構5により箱Bが物品A横一列分だけ後退した後、L形ガイド4を下動すれば夫々図23、図28及び図33となり、L形ガイド4を前後動させる必要がない。

【0026】更に、図25及び図29の状態から箱Bを後退させずに、L形ガイド4を前進し下動させて先端鉛直部4aを、鉛直ガイド3下部3aの後面と既に詰め込まれた物品A…との間に挟み込んだ後に、L形ガイド4と箱Bを同時に後退させることも考えられる。尚、前記整列機構1及び間欠移送機構5は上述したものに限定されず、例えば間欠移送機構5をプッシャーで構成する等、同様の機能を有するものであれば、他の構造のものでもよい。また、前記実施例では箱詰めの完了した箱Bを間欠移送機構5により前進させて箱供給位置に戻したが、これに限定されず、箱詰めの完了した箱Bを排出プッシャー等により左右側方に排出して、箱Bの交換を容易にすることも考えられる。

【0027】

【発明の効果】本発明は上記構成であるから、以下の利点を有する。

1. 鉛直ガイド及びL形ガイドの下動により箱内に挿入された鉛直ガイドの下部とL形ガイドの先端鉛直部とで、シャッターの下方に物品横一列分の挿入スペースが開けられ、その後にシャッターを下方へ開動させて該シャッター上の横一列の物品が下降し箱内に詰め込まれ、その後シャッターを開動させて整列機構によりシャッター上に次の物品が横一列に整列され、これと同時にL形ガイドを上動させて先端鉛直部を箱内から抜き、その後、間欠移送機構により箱を物品横一列分だけ前後縦方向へ移動してからL形ガイドを下動させて、シャッターの下方に物品横一列分の挿入スペースが既に詰め込まれ

た横一列物品の隣りに開けられ、シャッターの開動により上述の如く横一列の物品の詰め込みが順次繰り返されるので外形が不定形状の物品を箱内へ確実に詰め込める。従って、物品を持ち上げて箱内に移送する従来のものに比べ、外形が不定形状の物品でも作業能率を向上させながらコストを低減でき、しかも広いスペースを必要とせずコンパクトであると共に、物品を集積してから箱内に移送する従来のものに比べ、外形が不定形状の物品を所定数スムーズに箱詰めできる。

【0028】2. 箱内に横一列の物品が詰め込まれてL形ガイドを上動した後に、L形ガイドを前後方向へ移動させて先端鉛直部と鉛直ガイドの中間部を嵌合し、その後L形ガイドを下動し、箱とL形ガイドを共に上記縦移動と逆方向へ縦移動させて、シャッターの下方に挿入スペースを開けることにより、既に箱詰めされた横一列の物品が常時前後縦方向へ挟み込まれて圧縮保持されるので、箱詰め作業中に箱内の物品を一定形状に保てる。従って、外形が不定形状でしかも倒れやすい物品でも箱内で物品が倒れることがなく所定数の物品をスムーズに箱詰めできると共に、箱内の寸法が多少きつめでも物品を確実に箱詰めできる

【図面の簡単な説明】

【図1】本発明の一実施例を示す箱詰め装置の縦断正面図で整列機構を一部切欠して示すものある。

【図2】同拡大平面図で整列機構の全体を示すものである。

【図3】同拡大左側面図である。

【図4】その作動経過を示す縮小縦断正面図である。

【図5】その作動経過を示す縮小縦断正面図である。

【図6】その作動経過を示す縮小縦断正面図である。

【図7】その作動経過を示す縮小縦断正面図である。

【図8】その作動経過を示す縮小縦断正面図である。

【図9】その作動経過を示す縮小縦断正面図である。

【図10】その作動経過を示す縮小縦断正面図である。

【図11】その作動経過を示す縮小縦断正面図である。

【図12】その作動経過を示す縮小縦断正面図である。

【図13】その作動経過を示す縮小縦断正面図である。

【図14】その作動経過を示す縮小縦断正面図である。

【図15】その作動経過を示す縮小縦断正面図である。

【図16】その作動経過を示す縮小縦断正面図である。

【図17】その作動経過を示す縮小縦断正面図である。

【図18】その作動経過を示す縮小縦断正面図である。

【図19】その作動経過を示す縮小縦断正面図である。

【図20】本発明の他の実施例を示す箱詰め装置の縦断正面図である。

【図21】その作動経過を示す縮小縦断正面図である。

【図22】その作動経過を示す縮小縦断正面図である。

【図23】その作動経過を示す縮小縦断正面図である。

【図24】その作動経過を示す縮小縦断正面図である。

【図25】その作動経過を示す縮小縦断正面図である。

【図26】その作動経過を示す縮小縦断正面図である。

【図27】その作動経過を示す縮小縦断正面図である。

【図28】その作動経過を示す縮小縦断正面図である。

【図29】その作動経過を示す縮小縦断正面図である。

【図30】その作動経過を示す縮小縦断正面図である。

【図31】その作動経過を示す縮小縦断正面図である。

【図32】その作動経過を示す縮小縦断正面図である。

【図33】その作動経過を示す縮小縦断正面図である。

【図34】その作動経過を示す縮小縦断正面図である。

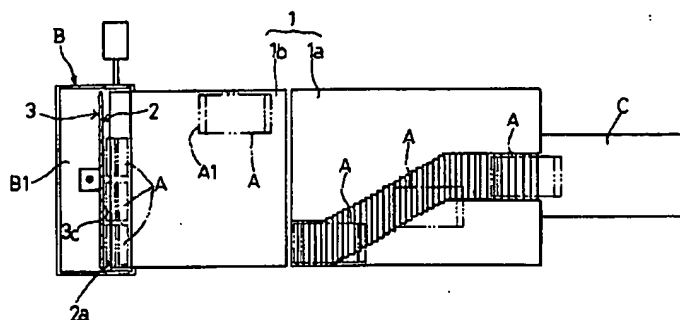
【図35】その作動経過を示す縮小縦断正面図である。

【図36】その作動経過を示す縮小縦断正面図である。

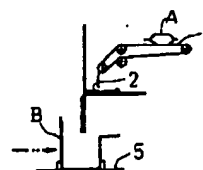
【符号の説明】

A 物品	B 箱
B1 上面開口	S 挿入スペース
1 整列機構	2 シャッター
3 鉛直ガイド	3a 下部
3b 中間部	4 L形ガイド
4a 先端鉛直部	5 間欠移送機構

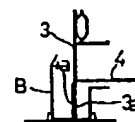
【図2】



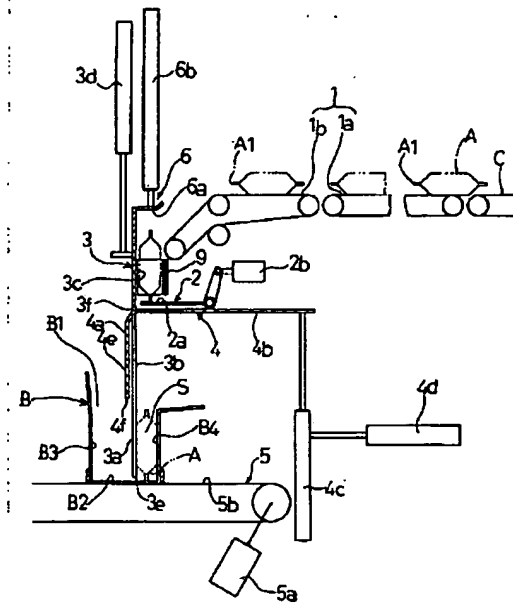
【図4】



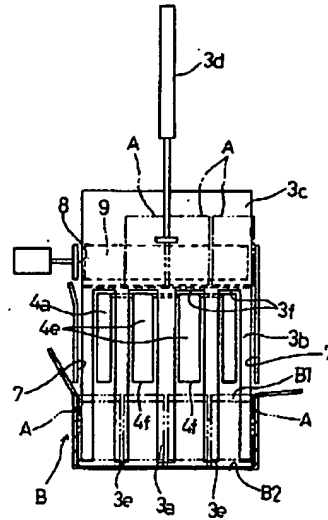
【図5】



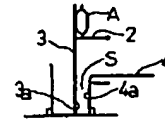
【図1】



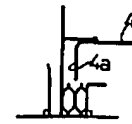
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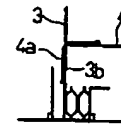
【図6】



【図13】



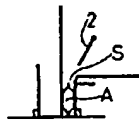
【図14】



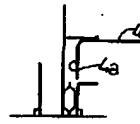
【図11】

【図12】

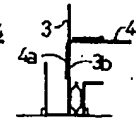
【図7】



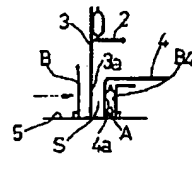
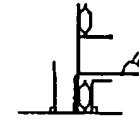
【図8】



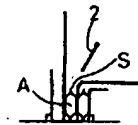
【図9】



【図10】

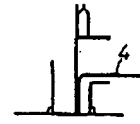


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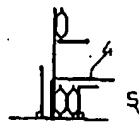


【図21】

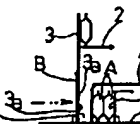
【図22】



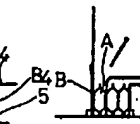
【図15】



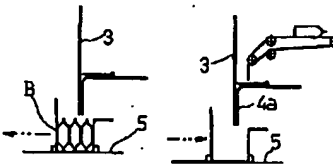
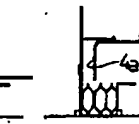
【図16】



【図17】



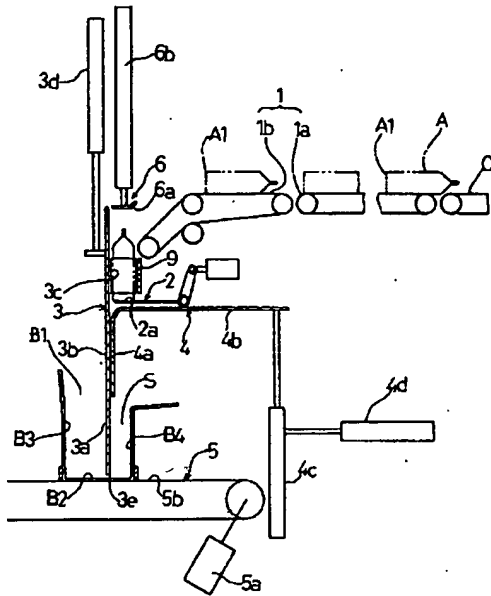
【図18】



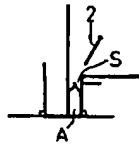
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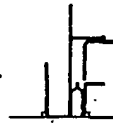
【図20】



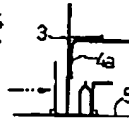
【図24】



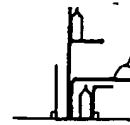
【図25】



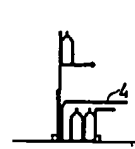
【図26】



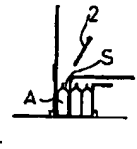
【図27】



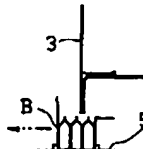
【図32】



【図34】



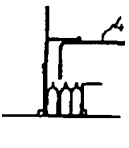
【図36】



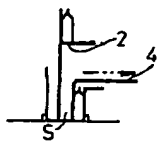
【図33】



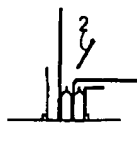
【図35】



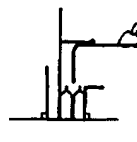
【図28】



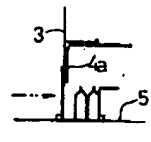
【図29】



【図30】



【図31】



PAT-NO: JP404339705A
DOCUMENT-IDENTIFIER: JP 04339705 A
TITLE: BOX PACKING DEVICE

PUBN-DATE: November 26, 1992

INVENTOR-INFORMATION:

NAME	COUNTRY
SHINODA, KIYOSHI	

ASSIGNEE-INFORMATION:

NAME	COUNTRY
TOKYO AUTOM MACH WORKS LTD	N/A

APPL-NO: JP03109398
APPL-DATE: May 14, 1991

INT-CL (IPC): B65B005/10

ABSTRACT:

PURPOSE: To pack articles with irregular outer shape in a box assuredly.

CONSTITUTION: An insertion space S for one lateral row of articles A is opened under a shutter 2 by a lower part 3a of a vertical guide 3 and a leading end vertical part 4a of an L shaped guide 4, which are inserted in a box B by the descent of the vertical guide 3 and L shaped guide 4. Then, the shutter 2 is opened downward, and the articles A... of one lateral row on said shutter 2 are lowered and packed in the box B. Then, the shutter 2 is closed, and the next articles A... are aligned in a lateral row on the shutter 2 by an aligning mechanism 1, and at the same time, the L shaped guide 4 is raised, and the leading end vertical part 4a is pulled out from the inside of the box B. Then, the box B is moved in the front and rear, longitudinal direction by a space for one lateral row of the article A, by an intermittent transfer mechanism 5, and then, an insertion space S for one lateral row of the articles A is opened next to the

already packed lateral row of the articles A... under the shutter 2, by lowering the L shaped guide 4. By opening the shutter 2, packing of one lateral row of the articles A... is repeated orderly as mentioned above.

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PTO 06-6380

Japanese Kokai Patent Application
No. Hei 4[1992]-339705

BOX PACKER

Kiyoshi Nobuta

UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. AUGUST 2006
TRANSLATED BY THE MCELROY TRANSLATION COMPANY

JAPANESE PATENT OFFICE
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KOKAI PATENT APPLICATION NO. HEI 4[1992]-339705

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No. of Inventions:	2 (Total of 7 pages)
Examination Request:	Not filed

BOX PACKER

[Bakozume sochi]

Inventor:	Kiyoshi Nobuta
Applicant:	Tokyo Jido Kikai Seisakusho K.K.

[There are no amendments to this patent.]

Claims

1. A type of box packer characterized by the following facts: on the downstream side of an aligning mechanism that set objects as a row in the left/right lateral direction, a shutter that is in contact with the bottom surface of said objects aligned as a lateral row and carries them is set such that it can be opened/closed freely in the up/down direction; a vertical guide in contact with the side surface of the objects on the shutter is set such that it can make free reciprocal movement in the up/down direction; as it moves downward, the lower portion of the vertical guide is inserted into the opening on the upper surface of the box; an L-shaped guide is set below said shutter such that it can make free reciprocal movement in the up/down direction; when it moves downward, the tip portion is inserted into the opening on the upper surface of the box, and at the same time, an intermittent transfer mechanism is set, and it is engaged to the box

and moves intermittently for each lateral row of the objects in the back-and-forth longitudinal direction perpendicular to the lateral alignment direction of the objects.

2. The box packer described in Claim 1 characterized by the following facts: the lower portion and intermediate portion of the vertical guide and the tip vertical portion of the L-shaped guide are formed in comb shape, and they function with each other in a freely movable way in the up/down direction and back-and-forth direction.

Detailed explanation of the invention

[0001]

Industrial application field

The present invention pertains to a type of box packer that can pack a prescribed number of objects in aligned shape in cardboard boxes or other boxes.

[0002]

Prior art

In the prior art, for the box packer of this type, for example, an industrial robot or the like is used to suck on the object, or a mechanical chuck is used to hold the object, and the object is put into the box through its opened upper side. As another scheme, after a prescribed number of objects are set in aligned shape and are stacked, the stack is transferred in the horizontal direction into a box through its opening opened sideways.

[0003]

Problems to be solved by the invention

However, for the aforementioned box packers of the prior art, there are some problems. For the former, as the objects are held one by one and moved into the box, the operation time becomes longer, and the operation efficiency becomes poor. In order to increase the operation efficiency, plural robots or other holding devices should be set in interlocked operation. As a result the cost rises, and a large space is needed. This is undesirable.

[0004]

In addition, for the former, if the objects are bags of powder, grains, chips and other fluidic substances, or gas, air or the like is filled in the bags, the outer shape is instable and undefined, sucking attachment and chucking cannot be performed with a high reliability, and the object may fall down while being held up and transferred. This is undesirable. On the other hand, for the latter case, it is necessary to stack the objects beforehand, so that the objects must have a prescribed neat shape. If the outer shape of the objects is undefined as aforementioned, the stack

may collapse, and the entirety of the objects cannot be packed smoothly into the boxes. This is undesirable.

[0005]

The purpose of the present invention is to solve the aforementioned problems of the prior art by providing a type of box packer characterized by the fact that it can pack objects with undefined outer shapes with a high reliability, and the objects in the box can be kept in the prescribed shape during the box packing operation.

[0006]

Means to solve the problems

In order to solve the aforementioned problems, the present invention provides a type of box packer characterized by the following facts: on the downstream side of an aligning mechanism that arranges objects as a row in the left/right lateral direction, a shutter that is in contact with the bottom surface of said objects aligned as a lateral row and carries them is set such that it can be opened/closed freely in the up/down direction; a vertical guide in contact with the side surface of the objects on the shutter is set such that it can make free reciprocal movement in the up/down direction; as it moves downward, the lower portion of the vertical guide is inserted into the opening on the upper surface of the box; an L-shaped guide is set below said shutter such that it can make free reciprocal movement in the up/down direction; when it moves downward, the tip vertical portion is inserted into the opening on the upper surface of the box, and at the same time, an intermittent transfer mechanism is set, and it is engaged to the box and moves intermittently for each lateral row of the objects in the back-and-forth longitudinal direction perpendicular to the lateral alignment direction of the objects.

[0007]

Also, the following scheme is preferred: the lower portion and intermediate portion of the vertical guide and the tip vertical portion of the L-shaped guide are formed in comb shape, and they function with each other in a freely movable way in the up/down direction and back-and-forth direction.

[0008]

Operation

According to the present invention with the aforementioned constitution, as the vertical guide and L-shaped guide move downward, by means of the lower portion of the vertical guide inserted into the box and the tip vertical portion of the L-shaped guide, below the shutter, the

insertion space of the lateral row of objects is opened; then, as the shutter is driven to open downward, the lateral row of objects on the shutter are lowered and packed in the box. Then, the shutter is driven to close, and by means of the aligning mechanism, the next lateral row of objects are set. At the same time, as the L-shaped guide is driven to move upward, the vertical tip portion is pulled out from the box. Then, by means of the intermittent transporting mechanism, the box is driven to move in the back-and-forth longitudinal direction by a distance corresponding to the lateral row of objects. Then, the L-shaped guide is driven to move downward, and the insertion space of the lateral row of objects below the shutter is opened adjacent to the lateral row of objects that have been packed. As the shutter is driven to open, as explained above, packing of the lateral row of objects is performed repeatedly and sequentially.

[0009]

Then, after the lateral row of objects are packed in the box, and the L-shaped guide is driven to move upward, the L-shaped guide is driven to move in the back-and-forth longitudinal direction, so that the vertical tip portion and the intermediate portion of the vertical guide are fit to each other. Then, the L-shaped guide is driven to move downward, and both the box and the L-shaped guide are driven to move longitudinally in the direction opposite to said longitudinal movement, and the insertion space is opened on the lower side of the shutter. As a result, the packed lateral row of objects are always held in the back-and-forth longitudinal direction, and are pressed and held.

[0010]

Application example

In the following, the present invention will be explained in more detail with reference to an application example illustrated with figures. As shown in Figures 1 and 2, in this application example, objects A as non-self-supporting bags containing substances are transferred lying on transporting conveyer C and are transported at a prescribed interval. By means of aligning mechanism (1) set on the downstream side, plurality (say, four) of objects A are erected and aligned in the left/right lateral direction to form a row that is fed onto shutter (2). At the same time, plural rows, say, 3 rows, of said aligned objects A... set as rows in the left/right lateral direction are packed in box B with opened upper side.

[0011]

Said aligning mechanism (1) is composed of distributing part (1a) that distributes four objects A transported out from said transporting conveyer C in the back-and-forth longitudinal direction, and erecting part (1b) that rotates the distributed objects A to erect them. For example,

as shown in Figure 2, said distributing part (1a) is made of a distributing device with the conventional structure. It transports objects A sequentially transported out from transporting conveyer C in the longitudinal direction while it divides objects A in the left/right lateral direction each with the left/right width dimension of object A. The row of objects A are then fed to erecting part (1b). For example, as shown in Figure 1, erecting part (1b) is composed of an inclined conveyor, slope plate, etc. Objects A carried out from distributing part (1a) in lying posture are gradually inverted and erected on shutter (2) along with said movement in the longitudinal direction.

[0012]

For shutter (2), open/close plate (2a) is set below the downstream end of said erecting part (1b), and it is set in contact with bottom surface A1 of each object A erected on it, and at the same time, for example, opening/closing driving part (2b) is set connected to the base end of open/close plate (2a), and open/close plate (2a) is supported in free rotatable way in the upper/lower direction. Said opening/closing driving part (2b) is controlled to operate using the control part, and in the initial state, open/close plate (2a) is driven to move to close in the horizontal posture to standby. A lateral row of objects A prepared by aligning mechanism (1) are carried on open/close plate (2a). Also, when insertion space S is opened corresponding to a lateral row of objects A right below open/close plate (2a) by means of lower portion (3a) of vertical guide (3) and vertical tip portion (4a) of L-shaped guide (4), open/close plate (2a) is driven to move to open downward. Then, objects A... on open/close plate (2a) are lowered, and then open/close plate (2a) is driven to move to close to reset the initial state.

[0013]

Said vertical guide (3) is a thin sheet having a vertical dimension from inner bottom surface (B2) of box B set below said shutter (2) to erecting part (1b) of aligning mechanism (1). At least the left/right width dimension of lower portion (3a) is formed a little shorter than the inside dimension in left/right direction of box B, and at the same time, the rear surface of intermediate portion (3b) or upper portion (3c) is in contact with the front side surface of the lateral row of objects A carried on shutter (2), and on the front surface of upper portion (3c), upper/lower driving part (3d) of the air cylinder is connected, and it is supported in a freely reciprocal movable way in the up/down direction. This up/down driving part (3d) has its operation controlled by a control part. In the initial state, vertical guide (3) is driven to move upward, so that its lower end (3e) leaves upper opening (B1) of box B and goes upward, and, at the same time, intermediate part (3b) is in contact with objects A... on shutter (2) and in standby state. When box B is driven to move by intermittent transporting mechanism (5) to be explained

later to right beneath shutter (2) and stopped there, vertical guide (3) is driven to move downward and its lower portion (3a) is inserted into box B. However, lower end (3e) does not make contact with inner bottom surface (B2) of box B. In addition, upper portion (3c) makes contact with objects A... on shutter (2), and then, the front surface of lower portion (3a) makes contact with front inner surface (B3), so that the last lateral row of objects A... are packed in the box. Then, vertical guide (3) is driven to move upward to return to the initial state. In addition, in lower portion (3a) and intermediate portion (3b) of vertical guide (3), ribbon-shaped space (3f) with a left/right width dimension shorter than that of the object is formed in comb shape laterally until plural lower ends (3e) each facing the central portion in the left/right direction of each of objects A... carried on shutter (2) as a lateral row.

[0014]

In order to form L-shaped guide (4), the tip of horizontal base plate (4b) is bent downward, or a fixed thin-sheet shaped vertical tip part (4a) is set. The left/right width dimension of vertical tip part (4a) is formed shorter than the left/right inside dimension of box B, and, at the same time, its up/down dimension is formed longer than the height dimension of box B from inner bottom surface (B2) to upper opening (B1). On the base end of horizontal base plate (4b), for example, an air cylinder or another up/down driving part (4c) and back-and-forth driving part (4d) are set and connected, and vertical tip part (4a) is supported so that it can move freely in the up/down direction and back-and-forth longitudinal distribution. In addition, vertical tip part (4a) is set facing ribbon-shaped spaces (3f)... of lower portion (3a) of vertical guide (3), and ribbon-shaped pieces (4e)... that are inserted such that they can move freely in the up/down direction and back-and-forth longitudinal direction are formed in comb shape and are set as protrusion until lower end (4f).

[0015]

Said up/down driving part (4c) and back-and-forth driving part (4d) of L-shaped guide (4) are controlled by the control part to perform operation. In the initial state, vertical tip part (4a) is driven to move upward, and its lower end (4f) is driven to move upward to leave upper opening (B1). At the same time, ribbon-shaped pieces (4e)... are inserted into ribbon-shaped space (3f) of lower portion (3a) and intermediate portion (3b) of vertical guide (3), so that the two parts fit each other. The rear surface of ribbon-shaped pieces (4e)... is positioned a little in front of the rear surface of lower portion (3a) or intermediate portion (3b) of vertical guide (3), or it is positioned on the same plane as standby. When vertical guide (3) moves downward, and after L-shaped guide (4) moves forward in the down state of vertical guide (3), vertical tip part (4a) is driven to move downward and is inserted in box B. Then, vertical tip part (4a) is driven to

move backward, and, between its front surface and the rear surface of lower portion (3a) of vertical guide (3), a space corresponding to a lateral row of objects A..., that is, corresponding to the back-and-forth width dimension of object A, is opened as insertion space S. Then, while shutter (2) is driven to close, it is driven to move forward to return to the initial state.

[0016]

For example, as shown in Figure 1, intermittent transporting mechanism (5) is made of intermittent feeding conveyor set laterally in the back-and-forth longitudinal direction throughout below shutter (2) from the box feeding position. Said driving part (5a) is controlled by the control part to perform operation, and, at the box feeding position, box B with opened upper side is carried on transporting surface (5b) in a non-movable way. As a result, transporting surface (5b) is driven to move backward, so that rear inner surface (B4) of box B becomes parallel to the extending surface of lower portion (3a) of vertical guide (3). It is stopped when the spacing between the two surfaces becomes in agreement with the back-and-forth width dimension of object A. Then, each time when vertical tip part (4a) of L-shaped guide (4) is driven to move backward, at nearly the same time, it is driven to move intermittently by a distance corresponding to a lateral row of objects A, that is, the back-and-forth width dimension of object A. Then, vertical guide (3) is driven to move upward, and transporting surface (5b) is driven to move forward, so that box B is returned to the box feeding position.

[0017]

Also, as shown in Figure 1, above said shutter (2), pusher (6) is set such that it can make reciprocal up/down movement as shown in Figure 1. Its driving part (6b) is controlled by the control part. In the initial state, pressing surface (6a) is set above lateral row of objects A... carried on shutter (2) in standby state. Then, at nearly the same time as shutter (2) is driven to open, pressing surface (6a) is driven to move downward so that lowering of objects A... is performed smoothly. Then, while shutter (2) is driven to close, pressing surface (6a) is driven to move upward to return to the initial state.

[0018]

In addition, as shown in Figure 3, on the left/right sides of shutter (2), side guides (7), (7) are erected facing each other. They are in sliding contact with the left/right end surfaces of lateral row of objects A... carried on shutter (2) so as to guide the objects in the up/down direction, while positioning them in the left/right lateral direction. As needed, the upper end of one side guide (7) is set lower, and compressing pusher (8) is set such that it can move freely in the left/right lateral direction. Right after a lateral row of objects A... are fed from erecting part (1b)

of aligning mechanism (1) onto shutter (2), compressing pusher (8) is driven to move to protrude. As a result, said lateral row of objects A... are compressed in the left/right lateral direction so as to enter the space between side guides (7), (7). In the figure, (9) represents a fixing guide in contact with the rear side surface of lateral row of objects A... carried on shutter (2).

[0019]

In the following, an explanation will be given regarding the operation of the aforementioned box packer. First, as shown in Figure 4, objects A are set as a lateral row on shutter (2) by aligning mechanism (1), while they are erected and fed. At the same time, by means of intermittent transporting mechanism (5), box B is fed from the box feeding position to below shutter (2). As feeding of box B is stopped, as shown in Figure 5, vertical guide (3) and L-shaped guide (4) are both driven to move downward, and lower portion (3a) of vertical guide (3) and vertical tip part (4a) are inserted into box B. Then, as shown in Figure 6, L-shaped guide (4) is driven to move backward, and insertion space S corresponding to a lateral row of objects A is opened right below shutter (2) between the front surface of vertical tip part (4a) and the rear surface of lower portion (3a) of vertical guide (3).

[0020]

Right after that, as shown in Figure 7, shutter (2) is driven to open, and said lateral row of objects A... carried on it are lowered without breaking the aligned neat state, and they are packed into said insertion space S. After end of said packing operation, as shown in Figure 8, L-shaped guide (4) is driven to move upward, and its vertical tip part (4a) is pulled out from box B.

[0021]

Then, as shown in Figure 9, L-shaped guide (4) is driven to move forward, and its vertical tip part (4a) is fit to intermediate portion (3b) of vertical guide (3), and the rear surface of vertical tip part (4a) becomes a littler behind or flushed with the rear surface of intermediate portion (3b). Then, as shown in Figure 10, L-shaped guide (4) is driven to move downward, and its vertical tip part (4a) is inserted again into box B.

[0022]

Then, as shown in Figure 11, L-shaped guide (4) is driven to move backward, so that lateral row of objects A... that have been packed are held between the rear surface of tip vertical part (4a) and rear inner surface (B4) of box B, and at the same time, box B is driven to move

backward by a distance corresponding to lateral row of objects A, and insertion space S corresponding to a lateral row of objects A is opened right beneath shutter (2) between the front surface of vertical tip part (4a) and the rear surface of lower portion (3a) of vertical guide (3).

[0023]

Then, as shown in Figures 12-16, the same operation as that explained with reference to Figures 7-11 is repeated. Then, as shown in Figures 17-18, the final lateral row of objects A... are packed into box B, and then L-shaped guide (4) is driven to move upward. As a result, as shown in Figure 19, vertical guide (3) is driven to move upward, and box B that completed the packing operation is moved forward by intermittent transporting mechanism (5) to return to the box feeding position. Then, at the box feeding position, packed box B and empty box B are swapped, followed by repeating of said operation.

[0024]

Figures 21-36 illustrate another application example of the present invention. They illustrate the operation in which objects A as bags containing substances and allowing standing by themselves are transported at a prescribed interval from each other in lying posture on transporting conveyor C to aligning mechanism (1). Said lower portion (3a) of vertical guide (3) and tip vertical part (4a) of L-shaped guide (4) are formed in flat plate shape instead of the comb shape. In the initial state shown in Figure 21, and when L-shaped guide (4) is driven to move upward as shown in Figures 26 and 31, the front surface of tip vertical part (4a) is moved to as near the rear surface of vertical guide (3) as possible. Then, as shown in Figures 22, 27 and 32, while tip vertical part (4a) is near vertical guide (3), L-shaped guide (4) is driven to move downward, and as shown in Figures 23, 28 and 33, L-shaped guide (4) is driven to move backward, and insertion space S is opened below shutter (2).

[0025]

The operation in this application example is not limited to that shown in Figures 21-36. For example, one may adopt the following scheme: in the initial state shown in Figure 21, a spacing corresponding to a lateral row of objects is opened between the rear surface of vertical guide (3) and the front surface of tip vertical part (4a), and L-shaped guide (4) is driven to move downward. At the same time, from the state shown in Figures 25 and 36, L-shaped guide (4) does not move forward, and box B is driven to move backward by a distance corresponding a lateral row of objects A by intermittent transporting mechanism (5). Then, as L-shaped guide (4) is driven to move downward, the state becomes [as illustrated in] Figures 23, 28 and 33, and there is no need to move L-shaped guide (4) back/forth.

[0026]

In addition, one may also adopt the following scheme: from the state shown in Figures 25 and 29, box B is not driven to move backward, while L-shaped guide (4) is driven to move forward and downward, so that tip vertical part (4a) is held between the rear surface of vertical guide (3) and packed objects A..., L-shaped guide (4) and box B are driven to move backward at the same time. Also, said aligning mechanism (1) and intermittent transporting mechanism (5) are not limited to said scheme. For example, intermittent transporting mechanism (5) may have a pusher structure or the like. Any structure may be adopted as long as the same function can be realized. Also, in said application example, packed box B is driven to move forward by intermittent transporting mechanism (5) back to the box feeding position. However, the present invention is not limited to this scheme. For example, one may also adopt the following scheme: packed box B is exhausted by an exhausting pusher or the like to the left/right side. As a result, swapping of box B can be performed more easily.

[0027]

Effect of the invention

The present invention with the aforementioned constitution has the following advantages.

1. By means of the lower portion of the vertical guide and the tip vertical portion of the L-shaped guide inserted into the box as the vertical guide and L-shaped guide are driven to move downward, an insertion space corresponding to a lateral row of objects of the objects is opened below the shutter. Then, the shutter is driven to open downward, so that the lateral row of objects on the shutter are lowered and packed in the box. Then, the shutter is driven to close. Then, by means of the aligning mechanism, the next lateral row of objects are assigned. At the same time, the L-shaped guide is driven to move upward, so that the tip vertical portion is pulled out from the box. Then, by means of the intermittent transporting mechanism, the box is driven to move in the back-and-forth longitudinal direction corresponding to the lateral row of objects. Then, the L-shaped guide is driven to move downward, and an insertion space corresponding to the lateral row of objects is opened below the shutter and adjacent to the packed lateral row of objects. As the shutter is driven to open, packing of said lateral row of objects is performed sequentially, and an objects with undefined outer shape can be packed in the box with a high reliability. As a result, compared with the prior art in which the objects are held up and moved into the box, the present invention has the advantage that even for the objects with undefined outer shape, the operation efficiency still can be increased and the cost can be reduced. Also, a wide space is not needed as the system of the present invention is compact. At the same time, compared with the

prior art in which the objects are stacked and then moved into box, with the present invention, it is possible to pack a prescribed number of objects with undefined outer shape easily in the box.

[0028]

2. After the lateral row of objects are packed in the box, the L-shaped guide is raised, and then, the L-shaped guide is driven to move in the back-and-forth direction, so that the tip vertical portion and the intermediate portion of the vertical guide are fit with each other. Then, the L-shaped guide is lowered, and both the box and the L-shaped guide are driven to move in the longitudinal direction opposite to said longitudinal movement, and an insertion space is opened beneath the shutter. As a result, the lateral row of objects that have been packed in the box are always held in the longitudinal direction and are kept in the compressed state. As a result, the objects in the box are kept in a prescribed shape during the box packing operation. As a result, even with objects that have an undefined outer shape and are prone to falling down, it is still possible to pack them smoothly in the box without falling down. As a result, even when the dimensions of the interior of the box are irregular, it is still possible to pack the objects in the box with a high reliability.

Brief description of the figures

Figure 1 is a longitudinal front view of the box packer in an application example of the present invention. It has the aligning mechanism partially cut and shown here.

Figure 2 is an enlarged plane view of the box packer illustrating the overall aligning mechanism.

Figure 3 is an enlarged left side view of said box packer.

Figure 4 is a contracted longitudinally cut front view illustrating the operation process.

Figure 5 is a contracted longitudinally cut front view illustrating the operation process.

Figure 6 is a contracted longitudinally cut front view illustrating the operation process.

Figure 7 is a contracted longitudinally cut front view illustrating the operation process.

Figure 8 is a contracted longitudinally cut front view illustrating the operation process.

Figure 9 is a contracted longitudinally cut front view illustrating the operation process.

Figure 10 is a contracted longitudinally cut front view illustrating the operation process.

Figure 11 is a contracted longitudinally cut front view illustrating the operation process.

Figure 12 is a contracted longitudinally cut front view illustrating the operation process.

Figure 13 is a contracted longitudinally cut front view illustrating the operation process.

Figure 14 is a contracted longitudinally cut front view illustrating the operation process.

Figure 15 is a contracted longitudinally cut front view illustrating the operation process.

Figure 16 is a contracted longitudinally cut front view illustrating the operation process.

Figure 17 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 18 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 19 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 20 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 21 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 22 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 23 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 24 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 25 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 26 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 27 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 28 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 29 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 30 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 31 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 32 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 33 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 34 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 35 is a contracted longitudinally cut front view illustrating the operation process.
 Figure 36 is a contracted longitudinally cut front view illustrating the operation process.

Brief description of the reference numbers

- A Object
- B Box
- B1 Upper opening
- 2 Shutter
- 3 Vertical guide
- 3a Lower portion
- 3b Intermediate portion
- 4 L-shaped guide
- 4a Tip vertical part
- 5 Intermittent transporting mechanism

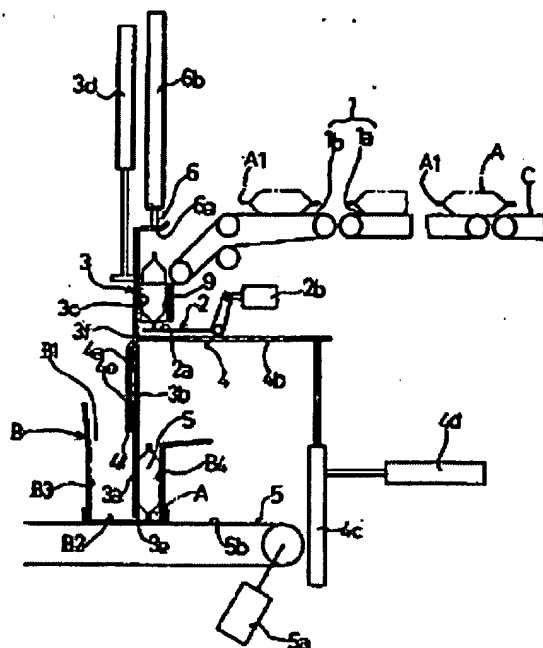


Figure 1

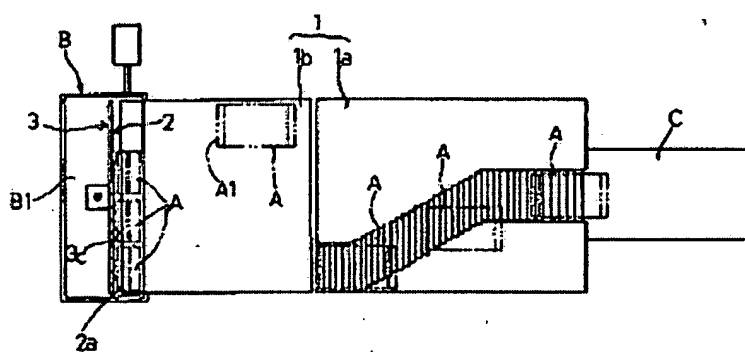


Figure 2

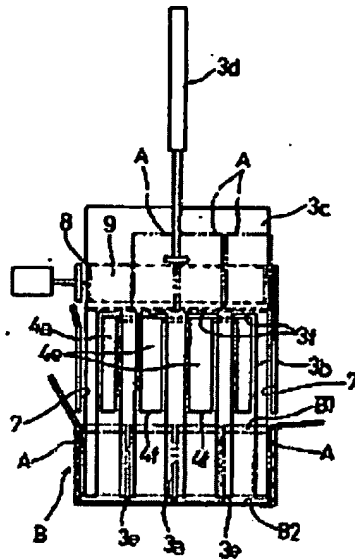


Figure 3

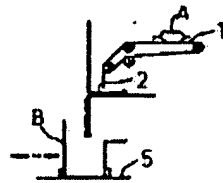


Figure 4

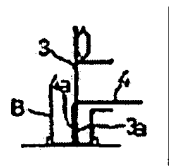


Figure 5

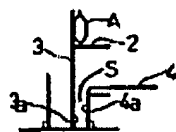


Figure 6

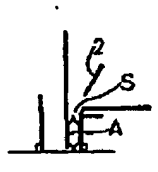


Figure 7

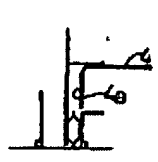


Figure 8



Figure 9

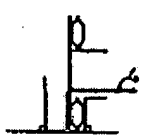


Figure 10

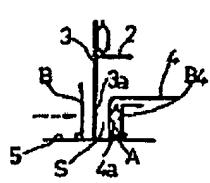


Figure 11

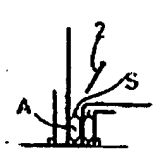


Figure 12

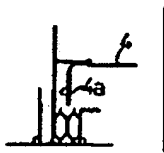


Figure 13

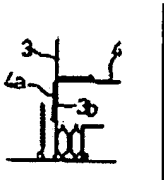


Figure 14



Figure 15

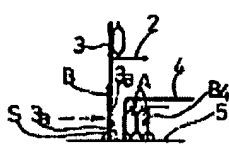


Figure 16

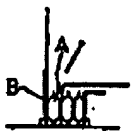


Figure 17

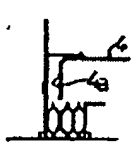


Figure 18

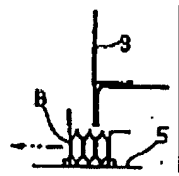


Figure 19

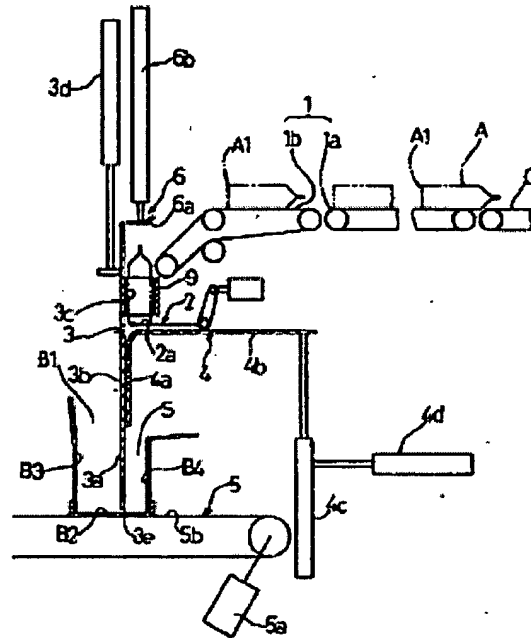


Figure 20

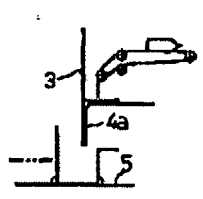


Figure 21

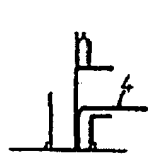


Figure 22

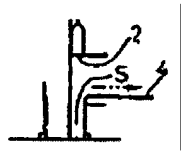


Figure 23

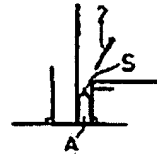


Figure 24

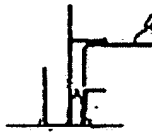


Figure 25

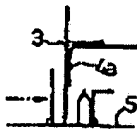


Figure 26

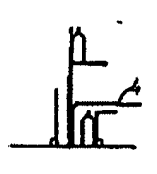


Figure 27

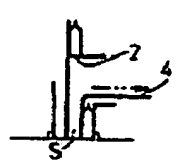


Figure 28

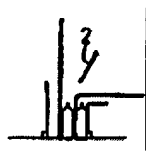


Figure 29

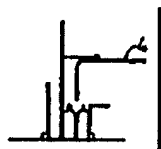


Figure 30



Figure 31

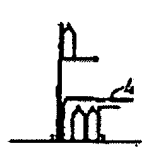


Figure 32



Figure 33

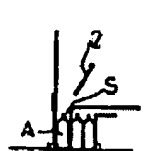


Figure 34



Figure 35

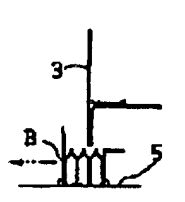


Figure 36